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ABSTRACT

Estimating the validity of a test is only one concern for the human resources professional developing a personnel selection battery. An equally important concern is whether the test will result in adverse impact against a member of a protected class. It would be useful if the probability of adverse impact could be estimated prior to spending time and money administering the test to an actual applicant pool. This paper presents a table based on the normal curve that uses selection ratios and effect sizes (d scores) obtained from information in test manuals to determine the ratio of the minority selection rate to the majority selection rate. The table is used by finding the point in the table where the selection ratio and the effect size intersect. The number found at this point in the table represents the percentage of minorities that will be selected as a percentage of the non-minority selection ratio. Any number less than the "magical" 0.80 or four-fifths indicates that the selection device will probably result in adverse impact. Table 1 shows minority selection ratio as a proportion of the non-minority selection ratio for effect sizes from 0.01 to 3.00. Table 2 gives effect sizes for preliminary use with the adverse impact table (Table 1) for biodata, interviews, personality tests, honesty tests, ability tests, interest inventories, and values tests. (SLD)

ESTIMATING FUTURE ADVERSE IMPACT USING SELECTION RATIOS AND GROUP DIFFERENCES IN TEST SCORE MEANS

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Estimating Future Adverse Impact Using Selection Ratios and Group Differences in Test Score Means

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The state-of-the-art in personnel testing has advanced to the point where, by using previously published meta-analyses, we can fairly accurately estimate the validity of a proposed test or selection procedure. For example, based on published meta-analyses, we would estimate that using biodata would result in a validity of about .34 (Beall, 1991), ability tests about .53 (Hunter & Hunter, 1984), and unstructured interviews about .17 (Wiesner, 1989).

However, estimating the validity of a test is only one concern for the human resource professional developing a selection battery. An equally important, and troublesome, concern is whether the test will result in adverse impact against a member of a protected class. Though adverse impact can be determined by administering a test to applicants and examining the passing rates of various groups, it would be far more useful if the probability of adverse impact could be estimated prior to spending time and money administering a test to an actual applicant pool.

With this idea in mind, it is the purpose of this paper to present a table based on the normal curve, that uses selection ratios and effect sizes (d scores) obtained from information in test manuals to determine the ratio of the minority selection rate to the majority selection rate. The table is used by finding the point in the table where the selection ratio and the effect size intersect. The number found at this point represents the percentage of minorities that will be selected as a percentage of the nonminority selection ratio. Any number less than the "magical" .80 or 4/5ths indicates that the selection device will probably result in adverse impact.

To use this table, two pieces of information are needed. The first is the effect size (d) representing the standard difference between the scores of two groups on a test. The effect size can be obtained in one of two ways: Calculation using the means and standard deviations provided in test manuals or using the meta-analysis results contained in Table 2.

As an example of the first method, suppose an organization is considering using a mechanical knowledge test to hire maintenance employees. For this type of position, the organization usually has about ten people applying for each opening (a selection ratio of .10). According to the information in the testing manual supplied by the company marketing the test, the average score for females is 72.1 and the average score for males is 80.2. The standard deviation for the test is 33.69. The following formula is used to compute the effect size (d):

(minority test mean - majority test mean)/overall standard deviation

For the above data, the effect size (d) would be (72.1 - 80.2)/33.69 = -.24.

To predict whether this test will result in adverse impact, the intersection of the row containing the effect size of -.24 and the column containing the selection ratio of .10 is located in Table 1. The number .34 found at this intersection indicates that the selection ratio for females will be 34% of the selection ratio for males; substantially below the 80% figure indicating adverse impact.

The second method of determining the effect size is to use the effect size estimates found in Table 2. The numbers in this table are the preliminary results of a series of meta-analyses which have not yet been completed, but will be by the summer of 1993. The numbers in Table 2 indicate that mechanical reasoning tests typically result in an effect size for gender of -.99. Using the .99 effect size and the .10 selection ratio, the selection ratio for females will be 0% of the selection ratio for males; indicating that no females will be hired.

Viewing the results from this table indicates how difficult it is to avoid adverse impact if a strict linear selection procedure is used. For example, with a selection ratio of .10, a test in which groups differ by only 6/100ths of a standard deviation (d=.06) would result in adverse impact if applicants were hired in a sequential order based on their raw test scores.

Table 1

Minority Selection Ratio as a Proportion of the Nonminority Selection Ratio

	Selection Ratio								
Effect size	**.10**	**.20**	**.30**	**.40**	**.50**	**.60**	**.70**	**.80**	**.90**
.01	.96	.98	.99	.99	.99	.99	.99	.99	.99
.02	.92	.96	.97	.98	.98	.98	.99	.99	.99
.03	.89	.94	.96	.97	.98	.98	.98	.99	.99
.04	.85	.92	.95	.96	.97	.97	.98	.98	.98
.05	.82	.91	.94	.95	.96	.97	.97	.98	.98
.06	.79	.89	.92	.94	.95	.96	.97	.97	.97
.07	.76	.87	.91	.93	.95	.95	.96	.97	.97
.08	.72	.85	.90	.92	.94	.95	.96	.96	.97
.09	.70	.83	.89	.91	.93	.94	.95	.96	.96
.10	.67	.82	.88	.91	.92	.94	.94	.95	.96
.15	.54	.74	.82	.86	.89	.91	.92	.93	.94
.20	.43	.67	.77	.82	.85	.88	.89	.91	.92
.25	.34	.60	.72	.78	.82	.85	.87	.88	.90
.30	.26	.54	.67	.74	.79	.82	.84	.86	.88
.35	.19	.49	.63	.71	.76	.80	.82	.84	.86
.40	.13	.44	.59	.67	.73	.77	.80	.82	.84
.45	.07	.39	.55	.64	.70	.75	.78	.80	.82
.50	.02	.35	.52	.61	.68	.72	.76	.79	.81
.55	.00	.31	.48	.59	.65	.70	.74	.77	.79
.60	.00	.28	.45	.56	.63	.68	.72	.75	.78
.65	.00	.24	.42	.54	.61	.66	.71	.74	.76
.70	.00	.22	.40	.51	.59	.64	.69	.72	.75
.75	.00	.19	.37	.49	.57	.63	.67	.71	.74
.80	.00	.16	.35	.47	.55	.61	.66	.69	.72
.85	.00	.14	.33	.45	.54	.60	.64	.68	.71
.90	.00	.12	.31	.43	.52	.58	.63	.67	.70
.95	.00	.10	.29	.42	.50	.57	.62	.66	.69
1.00	.00	.08	.27	.40	.49	.56	.61	.65	.68
1.10	.00	.05	.24	.37	.47	.53	.59	.63	.66
1.20	.00	.02	.22	.35	.44	.51	.57	.61	.65
1.30	.00	.00	.20	.33	.43	.50	.55	.60	.63
1.40	.00	.00	.18	.31	.41	.48	.54	.58	.62
1.50	.00	.00	.16	.30	.40	.47	.53	.57	.61
1.60	.00	.00	.15	.28	.38	.46	.52	.56	.60
1.70	.00	.00	.14	.27	.37	.45	.51	.56	.60
1.80	.00	.00	.13	.27	.37	.44	.50	.55	.59
1.90	.00	.00	.12	.25	.36	.44	.50	.54	.58

	Selection Ratio								
Effect size	**.10**	**.20**	**.30**	**.40**	**.50**	**.60**	**.70**	**.80**	**.90**
2.00	.00	.00	.11	.25	.35	.43	.49	.54	.58
2.10	.00	.00	.11	.25	.35	.43	.49	.54	.58
2.20	.00	.00	.10	.24	.35	.42	.48	.53	.57
2.30	.00	.00	.10	.24	.34	.42	.48	.53	.57
2.40	.00	.00	.10	.24	.34	.42	.48	.53	.57
2.50	.00	.00	.10	.24	.34	.42	.48	.53	.57
3.00	.00	.00	.09	.23	.33	.41	.47	.52	.57

Table 2

Effect Sizes for Preliminary Use with Adverse Impact Table

Test Type	Gender	Race
Biodata	-.11	-.28
Interviews		
Structured		-.01
Unstructured	-17	-.03
Personality		
Dominance	-.34	-.14
Influence	.30	-.08
Steadiness	.16	.08
Compliance	-.12	.22
Honesty	.23	.03
Ability		
Mechanical Reasoning	-.99	-.14
Spatial Relations	-.49	.02
Verbal Reasoning	.04	-.18
Numerical Ability	-.36	-.42
Language Usage (grammar, spelling, etc.)	.38	-.63
Word Knowledge	.04	-.68
Perceptual Speed and Accuracy	.26	-.16
Manual Speed and Dexterity	-.08	-.24
Typing		-.41
Filing	.36	-.48
Reading Comprehension	.12	-.54
Interest Inventories		
Science Professional	-.08	.02
Science Skilled	-.02	-.04
Technology Professional	-.95	.08
Technology Skilled	-.99	-.18
Consumer Education	.12	.14
Outdoor	-.54	-.18
Business Professional	.06	.04
Business Skilled	.12	.04
Clerical	.64	.08
Communication	.34	.22
Arts Professional	.00	.36
Arts Skilled	.61	.32
Values		
Investigative	-.02	-.26
Practical	.06	-.44
Independence	-.36	.00
Leadership	-.28	-.16
Orderliness	.16	-.22
Recognition	-.16	-.20
Aesthetic	.06	-.12
Social	.22	-.34

Note: Positive effect sizes indicate protected class scores highest